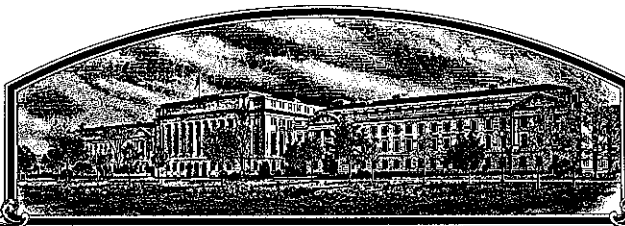


No.

9000218



# THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

## Idaho Agricultural Experiment Station

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT (1930, CH. 1542, AS AMENDED, 7 U.S.C. 2121 ET SEQ.)

WHEAT

'Centennial'

In Testimony Whereof, I have hereunto set my hand and caused the seal of the Plant Variety Protection Office to be affixed at the City of Washington, D.C. this 28th day of May in the year of our Lord one thousand nine hundred and ninety-three.

Attest

*Kenneth Hoans*  
Commissioner  
Plant Variety Protection Office  
Agricultural Marketing Service

*Mike Esny*  
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) (as it is to appear on the Certificate)		2. TEMPORARY DESIGNATION OR EXPERIMENTAL NO.	3. VARIETY NAME
Idaho Agricultural Experiment Station		ID0312	Centennial
4. ADDRESS (street and no. or R.F.D. no., city, state, and ZIP)		5. PHONE (include area code)	<b>FOR OFFICIAL USE ONLY</b> PVPO NUMBER 9000218
University of Idaho Moscow, ID 83843		(208) 885-7173 (208) 397-4162	
6. GENUS AND SPECIES NAME	7. FAMILY NAME (Botanical)		FILING Date July 3, 1990 Time <input type="checkbox"/> A.M. <input checked="" type="checkbox"/> P.M.
Triticum aestivum	Gramineae		FILING Filing and Examination Fee: \$ 2,150. - Date July 3, 1990 Certificate Fee: \$ 250. 00 Date Apr. 19, 1993
8. CROP KIND NAME (Common Name)	9. DATE OF DETERMINATION		
Soft white spring wheat	5/10/89		
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.)			
State Land Grant Experiment Station			
11. IF INCORPORATED, GIVE STATE OF INCORPORATION		12. DATE OF INCORPORATION	
13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS			
Dr. G. Lee, Director IAES University of Idaho Moscow, Idaho 83843		Dr. E. Souza, Breeder AREC University of Idaho Aberdeen, Idaho 83210 PHONE (include area code): (208) 397-4162	
14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED (Follow INSTRUCTIONS on reverse)			
a. <input checked="" type="checkbox"/> Exhibit A, Origin and Breeding History of the Variety.			
b. <input checked="" type="checkbox"/> Exhibit B, Novelty Statement.			
c. <input checked="" type="checkbox"/> Exhibit C, Objective Description of Variety			
d. <input checked="" type="checkbox"/> Exhibit D, Additional Description of Variety.			
e. <input checked="" type="checkbox"/> Exhibit E, Statement of the Basis of Applicant's Ownership.			
f. <input checked="" type="checkbox"/> Seed Sample (2,500 viable untreated seeds). Date Seed Sample mailed to Plant Variety Protection Office			
g. <input type="checkbox"/> Filing and Examination Fee (\$2,150) made payable to "Treasurer of the United States."			
15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See section 83(a) of the Plant Variety Protection Act.)			
<input type="checkbox"/> YES (If "YES," answer items 16 and 17 below)			
<input checked="" type="checkbox"/> NO (If "NO," skip to item 18 below)			
16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?		17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?	
<input type="checkbox"/> YES <input type="checkbox"/> NO		<input type="checkbox"/> FOUNDATION <input type="checkbox"/> REGISTERED <input type="checkbox"/> CERTIFIED	
18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.?			
<input type="checkbox"/> YES (If "YES," through <input type="checkbox"/> Plant Variety Protection Act <input type="checkbox"/> Patent Act. Give date: _____)			
<input checked="" type="checkbox"/> NO			
19. HAS THE VARIETY BEEN RELEASED, USED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES?			
<input type="checkbox"/> YES (If "YES," give names of countries and dates)			
<input checked="" type="checkbox"/> NO			

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in section 41, and is entitled to protection under the provisions of section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

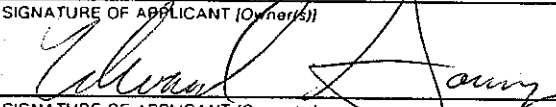
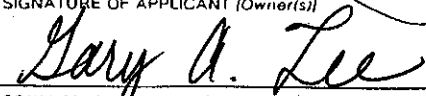
SIGNATURE OF APPLICANT (Owner(s))	CAPACITY OR TITLE	DATE
	Asst. Professor, Wheat Breeder	Feb. 5, 1990
SIGNATURE OF APPLICANT (Owner(s))	CAPACITY OR TITLE	DATE
	GARY A. LEE, DIRECTOR IDAHO AG. EXPERIMENT STATION	6/19/90 1

Exhibit A (Amended)  
Origin and Breeding History of Centennial

Centennial was derived from the backcross of 'Sterling' to the F1, Cowbird(S)/Sterling, to incorporate stripe rust (causal organism Puccinia striiformis) resistance and stiff straw into the Sterling background. Centennial was selected as the F3 head selection A803S-B-6, which was increased and tested in the Aberdeen spring wheat testing program. The selection A803S-B-6 was designated IDO312 when entered into the Tri-state Spring Wheat Trial in 1985. Centennial was tested as IDO312 in the Western Regional Spring Wheat Trial from 1986 to 1988. Head selection of Centennial were grown in the greenhouse during winter 1987-88 and selected for uniform auricle color and resistance to stripe rust. Each plant selection from the 1987-88 greenhouse was grown in 2 m rows at Aberdeen, ID during summer 1988 and evaluated for uniformity and conformity to agronomic and seed type. Seed from 128 selected single rows were grown at Tetonia, ID, summer 1989 in identity preserved plots and reselected for uniformity and conformity to agronomic seed type. Seed from the 1989 field was designated breeder seed of Centennial. The 1989 breeder seed lot has remained true to type through 3 generations grown at Aberdeen, Tetonia, and Twin Falls, ID in 1990, 1991, and 1992.

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## EXHIBIT B

## NOVELTY STATEMENT

'Centennial' is an early maturity wheat adapted to the Pacific Northwest (PNW) of the United States. Centennial is most similar to the cultivars 'Owens' and 'Sterling'. Centennial is distinguishable from Sterling when challenged with southeastern Idaho stripe rust isolates (Puccinia striiformis Westend. predominantly races CDL-3 & CDL-20). Table 1 lists stripe rust reactions of Centennial and Sterling relative to check cultivars. The second novelty is demonstrated by examination of the High Molecular Weight-glutenins (HMW-Glu) of the soft white spring wheat cultivars currently produced in the PNW and select breeding lines that will be candidates for release in the near future. Centennial carries a unique HMW-Glu allele at the Glu-1B locus, 13+16 (Table 2). It is the only cultivar or breeding line of soft white spring surveyed that carried the 13+16 allele. As such, seed lots of Centennial are readily distinguishable from other soft white spring cultivars including Owens which carries the 6+8 allele. Based on these two qualitatively inherited traits which have limited environmental interaction it is possible to definitively describe Centennial as a novel genotype.

Table 1. Stripe rust reactions of soft white spring wheat cultivars in comparison to Sterling and Centennial, field trials at Aberdeen, Idaho using inoculum isolated from the cultivar 'Fieldwin' and 'Lemhi 53'.

Cultivar name	Test year	Disease reaction type <sup>1,2</sup>	Percent of leaf occluded <sup>1</sup>	Resistance rating
Centennial	1983	0	0	Resist.
Sterling (6) <sup>3</sup>	1983	9	75	Susc.
Fieldwin	1983	9	85	Susc.
Dirkwin	1983	0	0	Resist.
Owens	1983	0	0	Resist.
Centennial	1984	0	0	Resist.
Sterling (2)	1984	7	60	Susc.
Fieldwin	1984	9	80	Susc.
Dirkwin	1984	0	0	Resist.
Owens	1984	4	trace	M. Resist.
Centennial (2)	1985	1	15	Resist.
Sterling (2)	1985	7	60	Susc.
Fieldwin	1985	8	50	Susc.
Dirkwin	1985	1	10	Resist.
Owens	1985	1	5	Resist.
Centennial (2)	1986	1	trace	Resist.
Sterling	1986	5	2	M. Susc.
Fieldwin	1986	4	trace	M. Resist.
Dirkwin	1986	0	0	Resist.
Owens	1986	1	trace	Resist.
Centennial	1987	0	0	Resist.
Sterling	1987	8	7	Susc.
Fieldwin	1987	8	10	Susc.
Dirkwin	1987	0	0	Resist.
Owens	1987	4	3	M. Resist.
<i>Range in reactions</i>				
Centennial	1983 to 1987	0 to 1	0 to 10	Resist.
Sterling	1983 to 1987	5 to 9	5 to 95	M. Susc. to Susc.
T-test probability of Centennial equal to Sterling, assuming unequal variances <sup>4</sup> :		0.0001	0.0003	

<sup>1</sup> Highest disease reaction rating if multiple observations were made.

<sup>2</sup> Disease reaction type: Type 0 - asymptomatic, Type 1 to 3 - resistant flecking or hypersensitive responses, Type 4 - urediospores produced from erupted pustules, Type 5 to 9 - increasing levels of susceptible reactions based on elongation and coalescence of pustules.

<sup>3</sup> Number of observations noted in parentheses if more than one plot of the cultivar was rated.

<sup>4</sup> Satterthwaite's approximation used to adjust for unequal variances. A normal analysis of variance was not used because of the unequal variances between cultivars for disease reaction ratings.

Table 2. High Molecular Weight Glutenin Composition of Soft White Spring Cultivars

Cultivar	Locus		
	Glu-1A	Glu-1B	Glu-1D
Bliss	Null	7	2+12
Centennial	Null	13+16	2+12
Dirkwin	2*	6+8/7+9 <sup>1</sup>	2+12
Edwall	Null	7+9	2+12
Fielder	Null	13+19	2+12
Fieldwin	Null	13+19	2+12
Federation	1	13+19	5+10
ID71006	Null	13+19	2+12
ID71027	1	13+19	5+10
ID71042	Null	7+9	2+12
ID71055	2*	13+19	2+12
ID71086	Null	13+19	2+12
ID71171	1	13+19	2+12
ID71202	Null	7+9	2+12
ID71208	1	13+19	2+12
ID71210	2*	13+19	2+12
ID71218	Null	13+19	2+12
ID71219	Null	13+19	2+12
ID71240	1	7+9	5+10
ID71244	2*	7+8	2+12
ID71252	Null	13+19	2+12
ID71260	Null	13+19	2+12/5+10 <sup>1</sup>
ID71320	2*	6+8	3+12
ID71353	Null	6+8	3+12
ID71363	Null	13+19	2+12
ID71377	Null	13+19	2+12
ID71441	Null	6+8	2+12
ID71419	Null	7+8	2+12
IDO285-52s	2*	6+8	2+12
IDO392	Null	7+8	2+12
IDO394	1	7+9/13+19 <sup>1</sup>	2+12
IDO405	Null	13+19	2+12
IDO406	2*	13+19	5+10
IDO407	Null	6+8	2+12
IDO408	Null	6+8	2+12

<sup>1</sup> The cultivar or breeding line is a mixture of two alleles at the designated locus.

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Table 2. High Molecular Weight Glutenin Composition of Soft White Spring Cultivars

Cultivar	Glu-1A	Locus	
		Glu-1B	Glu-1D
IDO409	2*	7+9	2+12
IDO410	1	13+19	5+10
IDO415	2*	13+19	2+12
IDO417	2*	6+8	2+12
IDO428	2*	6+8	2+12
IDO429	2*	6+8	2+12
IDO442	Null	13+19	2+12
IDO449	Null	13+19	2+12
IDO458	Null	6+8	2+12
OR487570	2*	7+8	5+10
Owens	Null	7+8	2+12
Penawawa	Null	7+9	5+10
Sprite	Null	17+18	3+12
Treasure	2*	6+8	2+12
Treasure Sib	2*	6+8	2+12
Wakanz	Null	7+9	5+10
WA7496	2*	7+9	2+12



2-1-8

FORM APPROVED: OMB NO. 0581-0065

U.S. DEPARTMENT OF AGRICULTURE  
AGRICULTURAL MARKETING SERVICE  
LIVESTOCK AND SEED DIVISION  
BELTSVILLE, MARYLAND 20705

EXHIBIT C  
(Wheat)

OBJECTIVE DESCRIPTION OF VARIETY

WHEAT (TRITICUM SPP.)

INSTRUCTIONS: See Reverse.

NAME OF APPLICANT(S) Idaho Agricultural Experiment Station	FOR OFFICIAL USE ONLY
ADDRESS (Street and No. or R.F.D. No., City, State, and ZIP Code) University of Idaho Moscow, Idaho 83843	PVPO NUMBER 9000218
	VARIETY NAME OR TEMPORARY DESIGNATION Centennial

Place the appropriate number that describes the varietal character of this variety in the boxes below.  
Place a zero in first box (e.g.,  or ) when number is either 99 or less or 9 or less.

1. KIND:

1 = COMMON    2 = DURUM    3 = EMMER    4 = SPELT    5 = POLISH    6 = POULARD    7 = CLUB

2. TYPE:

1 = SPRING    2 = WINTER    3 = OTHER (Specify) \_\_\_\_\_  1 = SOFT    3 = OTHER (Specify) \_\_\_\_\_  
2 = HARD

1 = WHITE    2 = RED    3 = OTHER (Specify) \_\_\_\_\_

3. SEASON - NUMBER OF DAYS FROM EMERGENCE TO:

FIRST FLOWERING     LAST FLOWERING

4. MATURITY (50% Flowering):

NO. OF DAYS EARLIER THAN .....  1 = ARTHUR    2 = SCOUT    3 = CHRIS  
 NO. OF DAYS LATER THAN ..... None relevant .....  4 = LEMHI    5 = NUGAINE    6 = LEEDS

5. PLANT HEIGHT (From soil level to top of head):

CM. HIGH  
 CM. TALLER THAN ..... None relevant .....  
 CM. SHORTER THAN .....  1 = ARTHUR    2 = SCOUT    3 = CHRIS  
4 = LEMHI    5 = NUGAINE    6 = LEEDS

6. PLANT COLOR AT BOOTING (See reverse):

1 = YELLOW GREEN    2 = GREEN    3 = BLUE GREEN

7. ANTHUR COLOR:

1 = YELLOW    2 = PURPLE

8. STEM:

Anthocyanin: 1 = ABSENT    2 = PRESENT     Vaxy bloom: 1 = ABSENT    2 = PRESENT  
 Hairiness of last internode of rachis: 1 = ABSENT    2 = PRESENT     Internodes: 1 = HOLLOW    2 = SOLID  
 NO. OF NODES (Originating from node above ground)     CM. INTERNODE LENGTH BETWEEN FLAG LEAF AND LEAF BELOW

9. AURICLES:

Anthocyanin: 1 = ABSENT    2 = PRESENT     Hairiness: 1 = ABSENT    2 = PRESENT

10. LEAF:

Flag leaf at booting stage: 1 = ERECT    2 = RECURVED     Flag leaf: 1 = NOT TWISTED    2 = TWISTED  
3 = OTHER (Specify) \_\_\_\_\_  
 Hairs of first leaf sheath: 1 = ABSENT    2 = PRESENT     Vaxy bloom of flag leaf sheath: 1 = ABSENT    2 = PRESENT  
 MM. LEAF WIDTH (First leaf below flag leaf)     CM. LEAF LENGTH (First leaf below flag leaf):

7

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## 11. HEAD:

☐ 2 Density: 1 = LAX 2 = DENSE ☐ 4 Shape: 1 = TAPERING 2 = STRAP 3 = CLAVATE  
4 = OTHER (Specify) Ovate

☐ 4 Awnedness: 1 = AWNLESS 2 = APICALLY AWNLETED 3 = AWNLETED 4 = AWNED

☐ 2 Color at maturity: 1 = WHITE 2 = YELLOW 3 = PINK 4 = RED  
5 = BROWN 6 = BLACK 7 = OTHER (Specify):

☐ 0 ☐ 7 CM. LENGTH ☐ 0 ☐ 9 MM. WIDTH

## 12. GLUMES AT MATURITY:

☐ 1 Length: 1 = SHORT (CA. 7 mm.) 2 = MEDIUM (CA. 8 mm.) 3 = LONG (CA. 9 mm.)  
☐ 2 Width: 1 = NARROW (CA. 3 mm.) 2 = MEDIUM (CA. 3.5 mm.)  
3 = WIDE (CA. 4 mm.)

☐ 3 Shoulder shape: 1 = WANTING 2 = OBLIQUE 3 = ROUNDED  
4 = SQUARE 5 = ELEVATED 6 = APICULATE ☐ 2 Beak: 1 = OBTUSE 2 = ACUTE 3 = ACUMINATE

## 13. COLEOPTILE COLOR:

☐ 1 1 = WHITE 2 = RED 3 = PURPLE

## 14. SEEDLING ANTHOCYANIN:

☐ 1 1 = ABSENT 2 = PRESENT

## 15. JUVENILE PLANT GROWTH HABIT:

☐ 3 1 = PROSTRATE 2 = SEMI-ERECT 3 = ERECT

## 16. SEED:

☐ 3 Shape: 1 = OVATE 2 = OVAL 3 = ELLIPTICAL ☐ 1 Check: 1 = ROUNDED 2 = ANGULAR

☐ 1 Brush: 1 = SHORT 2 = MEDIUM 3 = LONG ☐ 1 Brush: 1 = NOT COLLARED 2 = COLLARED

☐ Phenol reaction: 1 = IVORY 2 = FAWN 3 = LT. BROWN  
(See instructions): 4 = BROWN 5 = BLACK

☐ 1 Color: 1 = WHITE 2 = AMBER 3 = RED 4 = PURPLE 5 = OTHER (Specify)

☐ 0 ☐ 8 MM. LENGTH ☐ 0 ☐ 3 MM. WIDTH ☐ 3 ☐ 5 GM. PER 1000 SEEDS

## 17. SEED CREASE:

☐ 3 Width: 1 = 60% OR LESS OF KERNEL 'WINOKA'  
2 = 80% OR LESS OF KERNEL 'CHRIS'  
3 = NEARLY AS WIDE AS KERNEL 'LEHMI'  
☐ 3 Depth: 1 = 20% OR LESS OF KERNEL 'SCOUT'  
2 = 35% OR LESS OF KERNEL 'CHRIS'  
3 = 50% OR LESS OF KERNEL 'LEHMI'

## 18. DISEASE: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

☐ 1 STEM RUST (Races) field races ☐ 0 LEAF RUST (Races) field races ☐ 2 STRIPE RUST (Races) field races ☐ 1 LOOSE SMUT

☐ 0 POWDERY MILDEW ☐ 1 BUNT ☐ OTHER (Specify)

## 19. INSECT: (0 = Not Tested, 1 = Susceptible, 2 = Resistant)

☐ 0 SAWFLY ☐ 0 APHID (Bydv.) ☐ 0 GREEN BUG ☐ 0 CEREAL LEAF BEETLE

☐ 1 OTHER (Specify) field races HESSIAN FLY  
Hessian fly RACES: ☐ GP ☐ A ☐ B ☐ C  
☐ D ☐ E ☐ F ☐ G

## 20. INDICATE WHICH VARIETY MOST CLOSELY RESEMBLES THAT SUBMITTED:

CHARACTER	NAME OF VARIETY	CHARACTER	NAME OF VARIETY
Plant tillering	Sterling	Seed size	Sterling
Leaf size	Sterling	Seed shape	Sterling
Leaf color	Sterling	Coleoptile elongation	Sterling
Leaf carriage	Sterling	Seedling pigmentation	Sterling

## INSTRUCTIONS

GENERAL: The following publications may be used as a reference aid for the standardization of terms and procedures for completing this form:

- (a) L.W. Briggles and L. P. Reitz, 1963, Classification of Triticum Species and Wheat Varieties Grown in the United States, Technical Bulletin 1278, United States Department of Agriculture.
- (b) W.E. Walls, 1965, A Standardized Phenol Method for Testing Wheat Seeds for Varietal Purity, contribution No. 28 to the handbook of

## EXHIBIT D

## ADDITIONAL DESCRIPTION OF CENTENNIAL

Centennial is a semi-dwarf wheat equal in height to Penewawa under irrigation and 5 to 10 cm taller than Penewawa under dryland conditions at Tetonia. Centennial has pubescent, purple auricles; semi-erect, short flag leaves and dark green plant color at heading. Centennial has short, ovate, awned heads; anthers are yellow lacking purple pigmentation; glumes are non-pubescent and non-waxy; chaff color is whitish-yellow at maturity. The flour protein, ash content and milling percentage of Centennial is intermediate between Treasure and Penewawa. Centennial's soft wheat quality was rated as promising by the Western Region Wheat Quality Laboratory during testing in the Western Regional Spring Wheat Nursery. Centennial is resistant to stripe rust, susceptible to stem rust (causal organism *Puccinia graminis*), and moderately susceptible to black chaff (causal organism *Xanthomonas campestris* pv. *undulata*).

## EXHIBIT F

## AGRONOMIC AND QUALITY DATA FOR CENTENNIAL

Table 1	Yield Data
Table 2	Test Weight Data
Table 3	Milling and Baking Data From Southeastern Idaho
Table 4	Agronomic Data
Table 5	Western Regional Spring Wheat Nursery Yield Summary, 1986-88
Table 6	Western Regional Spring Wheat Nursery Quality Data, 1986-88

Table 1. Yield data for Centennial and other relevant cultivars from Idaho locations, 1984 to 1989.

Name	Aberdeen irrigated yield bu/ac	Twin Falls irrigated yield bu/ac	Tetonia irrigated yield bu/ac	Tetonia dryland yield bu/ac	Moscow yield bu/ac	Bonnors Ferry yield bu/ac	Ontario irrigated yield bu/ac
Centennial	87.5(6)*	84.9(4)	78.5(4)	48.0(4)	77.7(2)	39.7(3)	112.5(3)
Bliss	82.3(6)	82.8(5)	61.9(4)	47.7(5)	ND	ND	ND
Dirkwin	73.8(6)	78.9(5)	64.8(2)	48.7(5)	ND	ND	ND
Edwall	79.5(4)	75.6(4)	62.3(1)	50.2(4)	ND	ND	ND
Federation	54.8(6)	58.7(4)	ND	38.9(5)	64.8(2)	26.3(3)	95.7(3)
Fieldwin	88.3(5)	87.1(4)	68.7(4)	45.6(4)	ND	ND	ND
Owens	84.3(6)	83.1(5)	64.2(4)	46.3(5)	91.2(2)	25.8(3)	114.9(3)
Penewawa	93.2(6)	80.8(4)	68.9(4)	49.3(5)	72.5(2)	20.3(3)	112.9(3)
Treasure	94.7(6)	89.6(4)	71.0(4)	46.9(4)	ND	ND	ND
Wakanz	81.9(6)	76.9(4)	68.6(1)	46.8(5)	78.8(2)	24.9(3)	109.0(3)

\* Not all entries grown in together for all years, yields are adjusted by common entries.

Numbers in parentheses indicate years tested.

Table 2. Test weight data for Centennial and other relevant cultivars  
from Idaho locations, 1984 to 1989.

Name	Aberdeen irrigated test wt #/bu	Twin Falls irrigated test wt #/bu	Tetonia irrigated test wt #/bu	Tetonia dryland test wt #/bu	Moscow test wt #/bu	Bonniers Ferry test wt #/bu	Ontario irrigated test wt #/bu
Centennial	59.8*	61.7	61.8	60.7	64.0	61.9	61.8
Bliss	57.6	60.5	53.6	58.3	ND	ND	ND
Dirkwin	54.7	57.4	56.8	56.1	ND	ND	ND
Edwall	57.4	58.4	57.6	58.5	ND	ND	ND
Federation	56.1	58.5	ND	58.4	56.0	57.4	60.0
Fieldwin	59.8	60.6	58.6	58.4	ND	ND	ND
Owens	59.3	61.4	59.5	60.1	62.7	60.9	62.8
Penewawa	59.1	60.4	58.4	59.1	62.8	59.6	63.3
Treasure	58.0	60.5	58.8	59.3	ND	ND	ND
Wakanz	57.5	59.4	58.6	58.2	63.4	58.1	61.5

\* Not all entries grown in together for all years, test weights are adjusted by common entries.

Number of years each cultivar was tested at a location identical to Table 1.

Table 3. Milling and baking data for Centennial and other relevant soft white spring wheats .  
for 1984 to 1988, data from 10 year-location environments included.

Name	Flour protein percent	SE*	Flour milling percent	SE	Flour ash content	SE	Cookie diameter	SE
	%				%		cm	
Centennial	10.0**	0.1	58.9	0.5	0.392	0.005	8.6	0.03
Bliss	9.9	0.1	57.8	0.6	0.421	0.007	8.7	0.04
Dirkwin	10.1	0.1	59.8	0.7	0.436	0.007	8.6	0.03
Edwall	10.1	0.2	59.8	1.0	0.459	0.011	8.6	0.06
Federation	9.9	0.2	56.2	0.8	0.393	0.009	8.5	0.05
Fieldwin	10.2	0.2	57.9	0.9	0.389	0.009	8.6	0.06
Owens	9.9	0.1	56.5	0.5	0.387	0.005	8.8	0.03
Penewawa	10.4	0.1	55.7	0.6	0.425	0.007	8.5	0.04
Treasure	9.5	0.1	59.7	0.6	0.389	0.006	8.9	0.03
Wakanz	10.1	0.1	59.1	0.6	0.438	0.007	8.8	0.04

\* SE: Standard error of the value

\*\* Not all entries grown in common yield trials for all years, data adjusted by common entries.

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Name	Aberdeen heading date	Tetonia heading date	Aberdeen maturity date	Aberdeen height in	Tetonia height in	Aberdeen straw strength(1)	Aberdeen lodging(2)	Black chaff rating(3)	Stripe rust reaction(4)
						1-5	1-9	0-9	
Centennial	22-Jun	6-Jul	29-Jul	32.1	22.0	2.5	1.1	4.3	R
Bliss	28-Jun	17-Jul	2-Aug	34.9	22.0	2.6	1.0	4.4	R
Dirkwin	25-Jun	ND	2-Aug	34.4	20.4	3.3	1.5	4.2	R
Edwall	23-Jun	11-Jul	ND	32.6	22.4	2.3	1.8	4	R
Federation	27-Jun	12-Jul	1-Aug	37.4	25.6	2.6	1.6	5.4	S
Fieldwin	27-Jun	ND	2-Aug	36.2	23.4	2.9	1.4	4.8	S
Owens	23-Jun	12-Jul	1-Aug	34.6	21.5	3.0	2.0	4.9	R
Penewawa	25-Jun	12-Jul	31-Jul	32.5	18.6	2.6	1.4	3.5	MR
Treasure	26-Jun	15-Jul	3-Aug	33.6	19.5	2.9	1.4	3.2	R
Wakanz	25-Jun	10-Jul	1-Aug	32.9	20.0	2.4	1.3	3.4	MR

\*\* Not all entries grown in common yield trials for all years, data adjusted by common entries.

(1) 1=Stiff straw, 5=weak straw. (2) 1= no lodging, 9= completely lodged

(3) 0= no lesions, 4=lesions on flag leaf, 9= 95% of flag leaf occluded.

(4) R= resistant, s= susceptible, MR= marginally resistant.



Table 5. Average yield of Centennial for all locations in the Western Regional Spring Wheat Nursery for 1986 to 1988.

	Average yield @ locations < 50bu/ac*		Average yield @ locations > 50bu/ac*		Average yield @ all locations*		Yield as a percent of Federation**
	locations	yield bu/ac	locations	yield bu/ac	locations	yield bu/ac	
Centennial	#	bu/ac	#	bu/ac	#	bu/ac	%
Federation	11	41.7	32	94.3	43	81.6	139.9
Owens	11	30.7	33	67.4	44	58.5	100.0
Penawawa	11	35.8	32	89.5	43	76.2	130.8
Wakanz	9	35.0	24	91.7	33	72.8	133.3
	11	37.2	32	90.9	43	77.7	133.0

\* Yield unadjusted for missing locations.

\*\* Calculated as a percent of Federation only in common locations

Table 6. Average milling and baking data for Centennial from 1986 to 1989 Western Regional Spring Wheat Nursery.  
Evaluations conducted by the Western Wheat Quality Laboratory, Pullman.

Name	Flour yield	Flour ash	Flour protein	Mixograph absorption corrected	MacMichael viscosity corrected	Cookie diameter	Sponge cake volume	Sponge cake score*	Udon noodle wt. increase	Noodle score*	1986 comments**	1987 comments**	1988 comments**
	%	%	%		degrees	cm	cc	1 - 100	%	1 - 100			
Centennial	71.4	0.390	9.8	56.5	148.7	8.84	1263	76.3	363	77.0	5,	6, Q-SCS	NC
Federation	69.1	0.423	10.4	55.9	134.7	8.80	1275	75.3	374	76.0	NC	NC	NC
Owens	69.4	0.387	9.7	56.2	151.3	8.91	1288	78.7	375	78.7	NC	NC	NC
Penawawa	68.8	0.427	10.2	55.9	166.7	8.85	1292	82.0	360	77.7	NC	NC	NC
Wakanz	71.4	0.427	10.1	56.0	129.7	8.80	1223	73.0	369	77.3	6,	P-SCS, Q-MX	NC

\* Higher score preferred

\*\*5= Particularly promising quality, 6= Promising quality, P= poor, Q= Questionable, SCS= sponge cake score, Mix= Mixograph absorption.



United States  
Department of  
Agriculture

Agricultural  
Research  
Service

Northwest Area  
Western Wheat  
Quality Laboratory

Wilson 7  
Washington State University  
Pullman, Washington  
99164-4004

November 3, 1989

Dr. Edward Souza  
University of Idaho  
Branch Experiment Station  
P.O. Box AA  
Aberdeen, ID 83210

Dr Souza:

Our evaluation of ID312 in the PNW Grains Council Collaborative Report would be as follows for the baked products:

	<u>Bulk (check)</u>	<u>RATING</u>	<u>ID312</u>
Cookie diameter	5		4
Noodle score	5		6
Cake score	5		4

All of the other flour characteristics of ID312 are equal to the bulk check.

Enclosed, please find copies of the two collaborator reports returned to date and our copy of results.

Any questions about results, give us a call.

Best regards,

*Herb Jeffers*

Herb Jeffers

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2-1-20

USDA, ARS  
WESTERN WHEAT QUALITY LAB.  
PULLMAN, WA.

PNW COLLABORATIVE STUDY

PAGE 1

NURSCO 91

ID, OR, WA

LABNUM	VARIETY	IDNO	CLASS	TWT	FYELD	FASH	MSCOR	FPROT	MABSC	COOI
						1/		1/	3/	
882650 BLEND (PEN, DIRK, TR										
882651 .		ID312	SWS	59.9	77.8	0.40	86.1	9.7	55.3	9.15
882652 WAKANZ		WA7183	SWS	61.3	78.4	0.38	87.2	9.6	56.0	8.82
882653 .		6/ WA7176	SWS	63.9	79.7	0.42	84.7	9.1	56.2	9.08
882654 .		WA7492	SWS	62.9	78.8	0.39	87.1	8.6	56.6	9.05
			SWS	62.8	77.2	0.42	85.2	9.2	56.1	8.79
882655 .		WA7496	SWS	63.2	78.3	0.44	84.2	8.9	56.4	9.02
882656 .		6/ WA7497	SWS	65.0	80.1	0.34	89.1	9.2	57.4	9.26
882657 STEPHENS		CI017596	SWW	61.6	78.6	0.48	82.1	10.0	57.8	8.49
882658 .		ORFW301	SWW	60.6	78.6	0.45	83.6	10.8	58.8	8.95
882659 .		ORFW75336	SWW	60.8	77.1	0.47	82.7	9.4	58.4	8.29
882660 DAHS		CI017419	SWW	62.6	78.0	0.31	90.6	8.0	55.4	8.44
882661 P8I			SWW	62.2	76.3	0.33	89.6	8.7	56.1	8.90

- 1/ Observed Values Corrected to 14% Moisture Basis  
 3/ Absorption at 14% Moisture Corrected to 9% Protein  
 4/ Observed Values Corrected to 9% Protein  
 5/ Particularly Promising Overall Quality Characteristics  
 6/ Promising Overall Quality Characteristics

9000218

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PULLMAN, WA.

PHW COLLABORATIVE STUDY

CONTD. PAGE 1

NURSCO 91

ID, OR, WA

LABNUM	VARIETY	IDNO	CLASS	CODIC	MTYPE	CAVOL	SCSOR	WTIN	NOSCOR
882650	BLEND (PEN, DIRK, TR								
882651		ID312	SWS	9.23	2M	1235	68.0	359	72
882652	WAKANZ	WA7183	SWS	8.89	3M	1200	66.0	357	74
882653		WA7176	SWS	9.09	2M	1195	66.0	364	72
882654		WA7492	SWS	9.01	2M	1255	71.0	365	77
			SWS	8.81	2M	1200	65.0	361	75
882655		WA7496	SWS	9.01	3L	1235	69.0	331	73
882656		WA7497	SWS	9.28	4M	1260	70.0	338	71
882657	STEPHENS	C1017596	SWW	8.60	2M	1210	66.0	334	69
882658		ORF4301	SWW	9.15	2M	1200	67.0	335	68
882659		ORF475336	SWW	8.33	2M	1225	71.0	321	69
882660	DAUS	C1017419	SWW	8.33	4L	1210	70.0	326	70
882661	PBI		SWW	8.87	5L	1295	77.0	317	68

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NURSCO 91

ID, OR, WA

LABNUM	VARIETY	IDNO	CLASS	FABS	FABSC	FPEAK	FSTAB	VISC	VISCC	RMKS
882650 BLEND (PEN, DJRK, TR										
882651		ID312	SWS	57.5	56.8	3.2	3.3	111	95	
882652 WAKANZ		WA7183	SWS	55.7	55.1	3.7	4.7	118	103	Q-CODI, Q-SCSOR
882653		WA7176	SWS	57.0	56.9	3.5	3.3	82	80	
882654		WA7492	SWS	55.7	56.1	2.5	2.2	62	69	
			SWS	61.7	61.5	3.6	2.6	88	84	Q-CODI
882655		WA7496	SWS	56.2	56.3	3.5	6.2	66	67	Q-FASH
882656		WA7497	SWS	58.1	57.9	6.0	8.5	157	150	
882657 STEPHENS		CI017596	SWW	60.2	59.2	3.0	3.8	93	75	
882658		ORFW301	SWW	59.5	57.7	3.1	2.4	86	60	
882659		ORFW75336	SWW	61.5	61.1	2.5	3.0	74	68	P-CODI
882660 DAVIS		CI017419	SWW	57.4	58.4	2.5	6.4	105	140	
882661 PBI			SWW	58.3	58.6	5.0	10.5	81	88	

COMMENTS:

These samples represent advanced lines which are candidates for release.

Soft White Spring Selections (882650 and 882651) were grown at Aberdeen, ID.

Soft White Spring Selections (882652-2656) were grown at Lind, WA.

Soft White Winter Selections (882657-2659) were grown at Hermiston, OR.

Soft White Winter Selections (882660 and 882661) were grown at Pullman, WA.

One-two bushels were milled on a Miag Multimat (Pilot Mill) and sub-samples of the flour were sent to 16 industry laboratories for their evaluation. These cooperators represent major foreign and domestic users of PNW wheat. The protein content of some of the soft wheats were probably too high for good meaningful results. Results from the individual collaborators are summarized in the project report. See "Remarks" for our evaluation of weaknesses and major deficiencies.

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9000218<sub>2-1-23</sub>COLLABORATIVE NO. 10

PACIFIC NORTHWEST GRAINS COUNCIL  
SOFT WHEAT FLOUR QUALITY COLLABORATIVE REPORT

Bulk

Sample code # or variety #1 Blend of Penewawa, Dirkwin and Treasure  
Date sample Received 9-26-89  
Market Class SWS Check Sample Tested 10-3

Flour Characteristics	Rating <sup>2/</sup>	Flour Characteristics	Rating <sup>2/</sup>
Protein <u>10.1</u> <u>9.7</u> % <sup>1/</sup>	5	Viscosity _____ °Mac	5
Ash <u>.46</u> <u>.40</u> % <sup>1/</sup>	5	Sedimentation _____ ml	5
Moisture <u>13.0</u> <u>12.7</u> %	5	Cookie Diameter <u>475</u> cm	5
<u>Farinograph</u> or Mixograph		Spread Factor <u>75.4</u> %	5
Absorption <u>56.7</u> % <sup>1/</sup>	5	Falling Number <u>325</u> sec.	5
Peak <u>2.5</u> % min.	5	Max. amyl. vis. <sup>3/</sup> _____ B.U.	5
Stability <u>2.5</u> % min.	5	Cake Score _____	5
Area under the Curve _____ % cm <sup>2</sup>	5	Noodle Score _____	5
		Flour Yield <u>77.8</u>	5
		Milling Rating _____	5

<sup>1/</sup> Corrected to 14% Moisture Basis.<sup>2/</sup> Rating by the number system outlined in instructions.<sup>3/</sup> Maximum amylograph viscosity.

9000218 2-1-24

COLLABORATIVE NO. 10PACIFIC NORTHWEST GRAINS COUNCIL  
SOFT WHEAT FLOUR QUALITY COLLABORATIVE REPORTSample code # or variety ID 312 #2 Date sample Received 9-26-89  
Market Class SWS Compare to #1 Tested 10-3

Flour Characteristics	Rating <sup>2/</sup>	Flour Characteristics	Rating <sup>2/</sup>
Protein <u>10.2</u> <u>9.6</u> % <sup>1/</sup>	<u>5</u>	Viscosity _____ °Mac	
Ash <u>.44</u> <u>.38</u> % <sup>1/</sup>	<u>5</u>	Sedimentation _____ ml	
Moisture <u>12.7</u> <u>12.4</u> %	<u>5</u>	Cookie Diameter <u>46.3</u> cm	<u>3</u>
<u>Farinograph</u> or Mixograph		Spread Factor <u>75.9</u> %	<u>5</u>
Absorption <u>56.2</u> % <sup>1/</sup>	<u>6</u>	Falling Number <u>313</u> sec.	<u>5</u>
Peak <u>2.5</u> % min.	<u>5</u>	Max. amyl. vis. <sup>3/</sup> _____ B.U.	
Stability <u>3.5</u> % min.	<u>5</u>	Cake Score _____	
Area under the Curve _____ % cm <sup>2</sup>		Noodle Score _____	
		Flour Yield <u>78.4</u>	
		Milling Rating _____	

<sup>1/</sup> Corrected to 14% Moisture Basis.<sup>2/</sup> Rating by the number system outlined in instructions.<sup>3/</sup> Maximum amylograph viscosity.



COLLABORATIVE NO. 14

PACIFIC NORTHWEST GRAINS COUNCIL  
SOFT WHEAT FLOUR QUALITY COLLABORATIVE REPORT

Bulk

Sample code # or variety #1 Blend of Penewawa, Dirkwin and Treasure  
Date sample Received July 19, 1989  
Market Class SWS Check Sample Tested August

Flour Characteristics			Rating <u>2/</u>	Flour Characteristics			Rating <u>2/</u>
Protein	<u>9.7</u> %	<u>1/</u>	5	Viscosity	<u>—</u> °Mac		5
Ash	<u>.40</u> %	<u>1/</u>	5	Sedimentation	<u>—</u> ml		5
Moisture	<u>12.7</u> %		5	Cookie Diameter	<u>47.5</u> cm		5
Farinograph or Mixograph				Spread Factor	<u>80</u> X		5
Absorption	<u>53.7</u> %	<u>1/</u>	5	Falling Number	<u>360</u> sec.		5
Peak	<u>2.3</u> % min.		5	Max. amyl. vis. <sup>3/</sup>	<u>580</u> B.U.		5
Stability	<u>2.6</u> X min.		5	Cake Score	<u>800</u>		5
Area under the Curve	<u>—</u> % cm <sup>2</sup>		5	Noodle Score	<u>70.0</u>		5
				Flour Yield	<u>77.8</u>		5
				Milling Rating	<u>—</u>		5

1/ Corrected to 14% Moisture Basis.

2/ Rating by the number system outlined in instructions.

3/ Maximum amylograph viscosity.

COLLABORATIVE NO. 14PACIFIC NORTHWEST GRAINS COUNCIL  
SOFT WHEAT FLOUR QUALITY COLLABORATIVE REPORTSample code # or variety IP312 #2Date sample Received July 26, 1989Market Class SWS Compare to #1Tested August

Flour Characteristics		Rating <u>2/</u>	Flour Characteristics		Rating <u>2/</u>
Protein	<u>9.6</u> % <u>1/</u>	<u>5</u>	Viscosity	<u>—</u> °Mac	<u>—</u>
Ash	<u>.38</u> % <u>1/</u>	<u>5</u>	Sedimentation	<u>—</u> ml	<u>—</u>
Moisture	<u>12.4</u> %	<u>5</u>	Cookie Diameter	<u>47.2</u> cm	<u>5</u>
Farinograph or Mixograph			Spread Factor	<u>81</u> %	<u>5</u>
Absorption	<u>52.2</u> % <u>1/</u>	<u>5</u>	Falling Number	<u>310</u> sec.	<u>5</u>
Peak	<u>3.0</u> min.	<u>5</u>	Max. amyl. vis. <sup>3/</sup>	<u>950</u> B.U.	<u>5</u>
Stability	<u>4.2</u> min.	<u>5</u>	Cake Score	<u>765</u>	<u>3</u> ✓
Area under the Curve	<u>—</u> % cm <sup>2</sup>	<u>—</u>	Noodle Score	<u>738</u>	<u>6</u>
			Flour Yield	<u>78.4</u>	<u>5</u>
			Milling Rating	<u>—</u>	<u>—</u>

1/ Corrected to 14% Moisture Basis.2/ Rating by the number system outlined in instructions.3/ Maximum amylograph viscosity.

## EXHIBIT E

## STATEMENT OF THE BASIS OF APPLICANT'S OWNERSHIP

The Idaho Agricultural Experiment Station, University of Idaho, Moscow, Idaho is the applicant for protection in this case. The Idaho Agricultural Experiment Station completed selection and testing of Centennial through cooperative agreement with the United States Department of Agriculture Research Service following initial development by the United States Department of Agriculture Research Service. The Idaho Agricultural Experiment Station developed breeder's seed of Centennial and will maintain seed stocks for foundation seed increase and sale.